Common Vehicle Instrumentation Initiative (CVII)

An Introduction to the Future of Operational & Developmental Test Instrumentation

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ACM Systems

What is CVII?

A Program to Simplify Instrumenting Weapon Systems

- **CVII is a U.S. Army Developmental & Operational Test Command Program to Develop a “Common Communication Infrastructure Bus” for Instrumenting Weapon Systems**
- **CVII’s Open Published Architecture & Standard Provides full Interface Control Documentation to Assist Contractors Build CVII Compliant Devices**
- **Supports Wire & Wireless Interfaces and Peer to Peer Communications**
- **CVII’s Hot Plug & Play Migrates Weapon Instrumentation**

CVII Objective & Benefits

- **Provide the T&E Community a Common Communications Infrastructure Bus to Simultaneously Interconnect and Control an Array of Legacy and Future Instrumentation Devices on a Single Weapon Platform**
- **Eliminate Duplication of Effort, Establish Commonality, and Component Interoperability of Instrumentation Assets**
- **Drive the T&E Market to Common Open Interfaces & Standards**
- **Enable Sharing of Assets and Interoperability Between:**
  - **DT/OT Ranges**
  - **T&E and Training Ranges**
- **Streamline Testing - Piggyback Testing, Training, & Experimentation**

CVII Architecture & Standards

A Layered Approach: Physical, Link, Network, & Transaction

- **CVII Communication Infrastructure works with <u>any type of physical media</u>**
  - Wireless (TDMA, 802.11, 802.16, 802.20, Bluetooth, Satellite, etc)
  - Wired (FireWire—IEEE 1394, RS-232, RS-485, RS-422, etc)
- **Wired Physical Media on CVII is primarily based on the <u>high speed</u> FireWire bus that <u>provides power and signal</u> to Instrumentation Devices**
  - FireWire (IEEE-1394a) standard allows speeds up to 400 Mbps
  - Devices include Lasers, Detectors, Radios, Data Recorders, Sensors, Video, Pyro, …
- **Link Layer enables CVII to interface to <u>multiple physical media</u> at one time**
- **TCP/IP Network Layer allow CVII to <u>operate across heterogeneous environment.</u>**
- **Higher CVII layers (CORBA / XML) <u>drastically enhance interoperability</u>**

Developing Applications with CVII

Simplifies Management of Asset Growth and Compatibility Across U.S. Army Test and Training communities for Legacy and Future Systems.

- **Provides a uniform approach to implement instrumentation systems**
- **Inter-exchangeable capability on lower layer allow tailoring CVII for specific requirements.**
  - A suite of various physical layers are supported
- **Consistent interfaces enhances interoperability between multi-vendor products**
  - Networking Layer uses the TCP/IP protocols
  - Transaction and Presentation Layers use CORBA and a CVII object model (IDL/XML)
- **CVII Enables Hot-Plug-and-Play and Device Control**

CVII Architecture & Standards

Direct Tangible Benefits – Operators & Maintainers Perspective

- Single Weapon Systems Instrumentation Network for Voice, Video, & Data
- Over-the-Air Software Configuration and SW Upgrades
- IP Addressable Down to Lowest Level Module
- Ensures Correct HW & SW Configuration of Hosted Devices
- Powers Up and Down Instrumentation Devices as Required During Mission
- Interfaces to the Weapon System Bus to Receive All Weapon Commands
- Enables Full SA & Tactical Communications Analysis on Inst. Network
- Monitors and Reports Bit/Health/Failure Status of Devices on Network
- Routes Data to Storage Devices or Radio for Real-Time Relay

CVII Architecture & Standards

Direct Tangible Benefits – Service & Range Management Perspective

- **Enables Commonality Between Test & Training Communities**
- **Allows Sharing and Pooling in Development & in theUtilization of Assets**
- **Open Architecture Extends Competition**
- **Permits for Simultaneous Legacy and Future Instrumentation Operation**
- **Re-capitalizes Existing Instrumentation & Devices**
- **Enables Seamless Force-on-Force Joint Test or Training Operations**
- **Allows Training Ranges to Conduct High Fidelity War Fighting Experiments**

Based on Proven Technology
Open Architecture – Open Standard
Increased Interoperability
CVII
Range C3
Mobile C3
C
TENA
Leverages on Industry Produ
B
TENA/CTIA
GENERIC
RADIO INDEPENDANT
WIRELESS NET
GPS
CVII WEAPON INST. NET
A
PLAYERS
Reduced Development Cost
COMM
EQUIPMENT
RANGE
I/F Model
CORBA
IP Services
Drivers
Hardware
CVII Layers
Based on Available Technology
A = Internal Player I/F
B = C3 to Player and Player to Player I/F
C = C3 to Ranges

Common Vehicle Instrumentation Initiative CVI

Standard for Networking and Controlling Weapon & Range Instrumentation Assets

Direct Applicability to Embedded Solutions

Implementation Benefits:

- ✓ OS Independence
- ✓ HW Independence
- ✓ Radio Independence
- ✓ Intra-System Interoperability (On Weapon System)
- ✓ Inter-System Interoperability (On Range)
- ✓ Scalable Systems Management
- ✓ Individual Component Access
- ✓ Reduces O&M Costs
- ✓ Lowers Development Cost

Features:

- ✓ Hot Plug-n-Play
- ✓ Legacy & Future Assets, Simultaneous Interoperability
- ✓ Expandable, Modular, Flexible, Adaptable
- ✓ Reprogrammable Controller
  - RTCA, Fly-out Models, Geo Paring, Behavior, Module Control, BIT…
- ✓ High Speed Instrumentation Bus
  - Data, Voice, Video (100-400Mbps)
  - Power & Signal on same 11mm cable (4 amps)
  - Wireless Local Instrumentation Network

Published Open Standard:

- ✓ Instrumentation Developer Support Web Site
- ✓ Compliance & Validation Test Bed

Standards Compatibility:

- ✓ Complements TENA
- ✓ CTIA Compliant
- ✓ Extensive COTS Leveraging
- ✓ Supports One TESS Initiatives

PM TRADE

PM TRADE

Operational Test Command

Developmental Test Command

PM ITTS

USMC Training Systems

ACM Systems

Common Architecture Supports Test & Training Missions

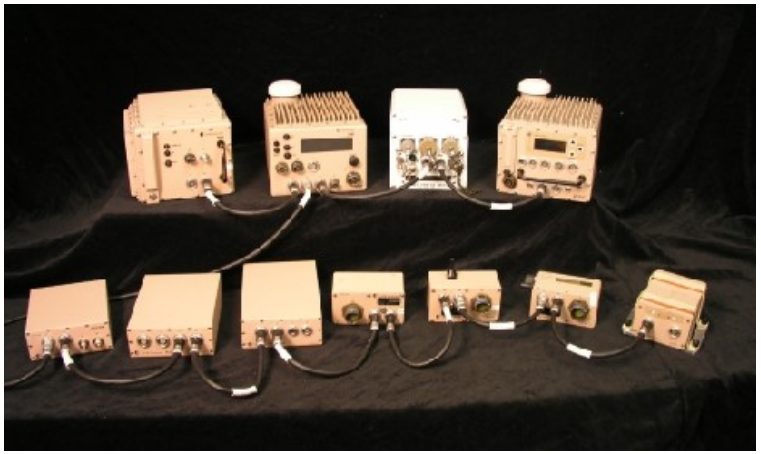
US Army & USMC Programs

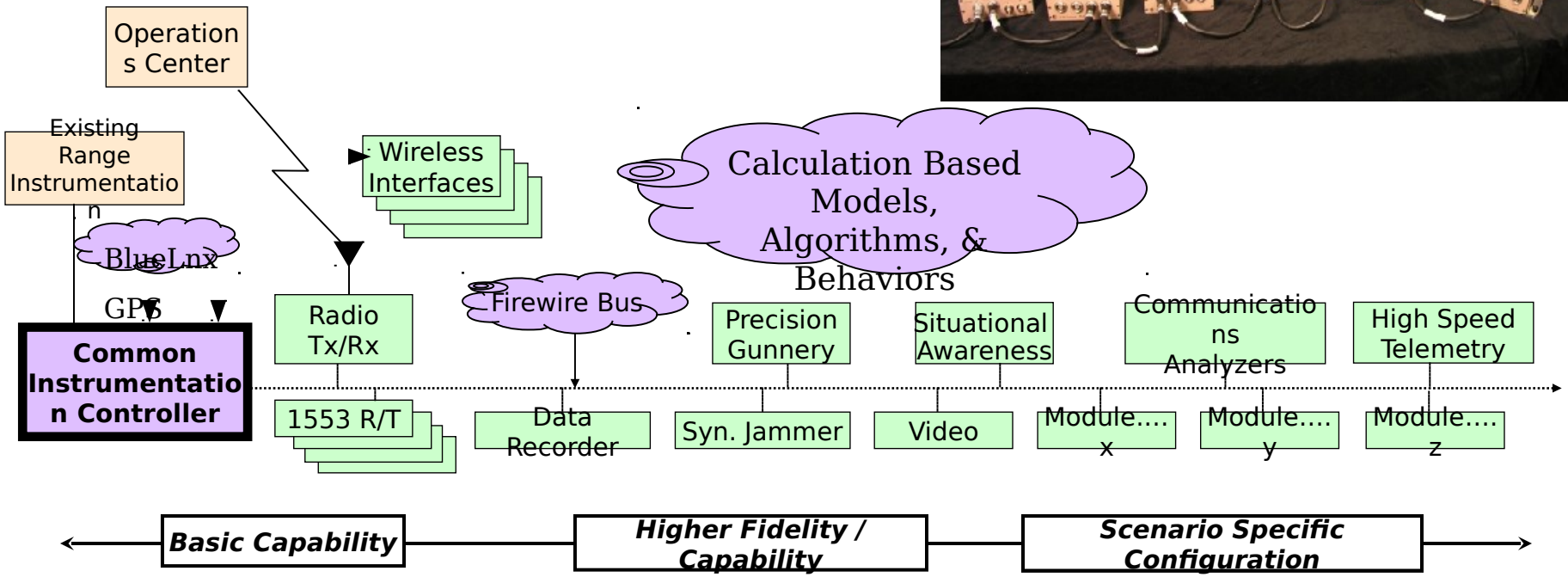
ATC
- ADMAS
- MASS

OTC
- OT-TES
- MAIS

PM TRADE
- DMPRC
- NTC Live Fire

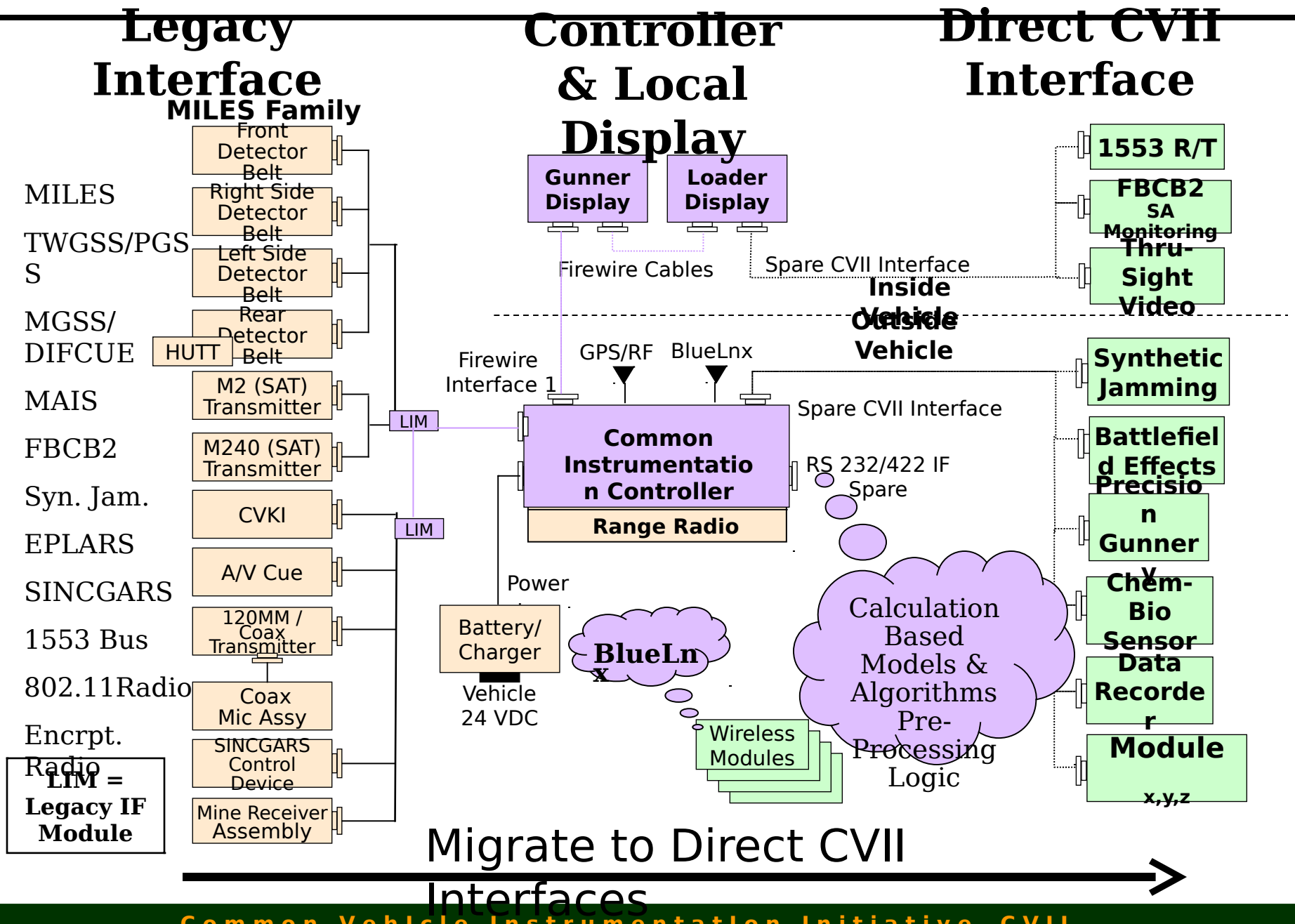
USMC
- CRIS





Training	Home Station	CTC		AWE	
Testing	Customer Tests	LUT	DT	OT	Joint Tests

Example of CVII M1 Tank Implementation



State-of-the Art CVII Implementation

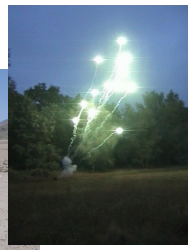
Family of Controllers with Common SW and HW Components Configured for Each Category of Operation Optimizing Value, Performance, & Growth

Weapons Server (CIC-WS)

BLUEFOR and OPFOR Weapon Systems

Remote Server (CIC-RS)

Dismount, Surrogate Weapons, Observer Controllers, Smart Targets



Remote Extension (CIC-R

Remote Battlefield Effects & Sensors

Target Pit

Common Architecture and Controller for All Weapons and Soldiers

CVII SW Based Instrumentation Network

Data, Voice, & Video

Manages and Controls all Devices on Bus

- **Target Pairing**
  - Laser (MILES,1.54um…)
  - 2 Way Laser (precision gunnery)
  - Geometric Pairing
- **Weapon/Vehicle Data**
  - 1553 Bus Monitor/Recording
  - LAN Monitoring/Recording
  - Digital RF Commo Monit/Rec
- **Digital/Analog Video**
  - Manprint
  - Thru-Sight
  - Range Safety
- **Sensors/Measurement**
  - IR/Laser
  - Radar
  - Chemical
  - Biological
  - Unique Test Instrumentation
- **Audio/ Visual Cues**
  - Strobe Lights
  - Pyro Signature Devices
  - Thermal Signature
  - Battlefield Effects
- **Synthetic Jammer**
  - Communications
  - GPS
  - Weapons
- **Communications**
  - Tracking Range/Building
  - High Speed Data Radio
  - Live Audio & Video
  - Range Safety
  - Target Control & Fight Back

- **Fully Reprogrammable SW, Logic, & Algorithms**

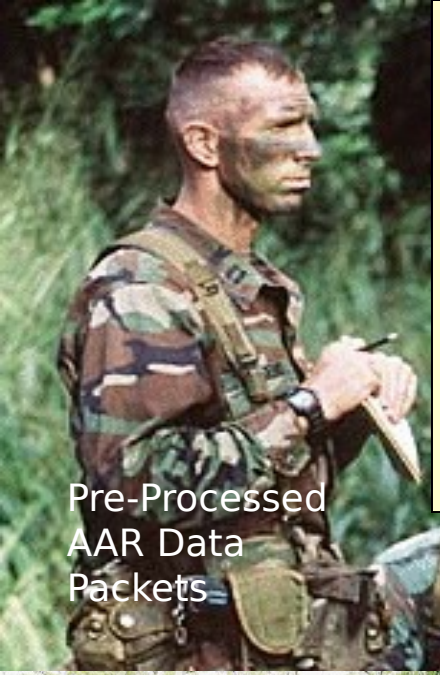
Unknown-Unknown

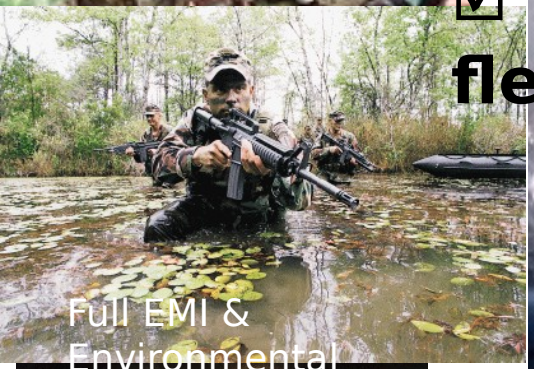
Tailored Testing & Training

☑ **Not “one size fits all,” but…**

☑ **Configured for soldiers current & future unit, mission and systems training objectives**

☑ **Enables growth & flexibility**





CVII Summary & Cost Savings Potential

- Reduce Acquisition & Sustainment Costs
- Rapid User Based Reconfiguration
- Flexible & Expandable Open Architecture
- Retard Obsolescence Issues
- Target Modular Upgrades & New Additional Capabilities
- Scalable to Accommodate a Vast Range of Missions
- Increase Competition & Grow the Business Base
- Leverage Off Service Investments Across Mission Areas
- Enable Interoperability Between Range Assets & Programs (Testing & Training)
- Steppingstone to Embedded Instrumentation & Future Army Requirements